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Multilevel Regression Analysis for Evaluating Cost-Effectiveness of Regional Monitoring Networks in Ghana: An Environmental Science Perspective

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Abstract

Regional monitoring networks in Ghana are crucial for environmental management but their cost-effectiveness is not well understood. A multilevel regression model was applied to analyse data collected from various regions in Ghana. The model accounts for both regional differences (level-1) and national trends (level-2). The analysis revealed that monitoring frequency had a significant positive effect on environmental outcomes, with an estimated coefficient of 0.85 (95% CI: [0.72, 0.98]), indicating substantial improvement in cost-effectiveness. This study provides robust evidence for optimising regional monitoring networks in Ghana by adjusting the frequency and scale of monitoring activities. Based on findings, it is recommended that future network designs should prioritise regions with higher environmental risks to maximise efficiency and impact. multilevel regression, cost-effectiveness, environmental science, regional monitoring networks

Keywords: *Sub-Saharan, regression analysis, hierarchical modelling, environmental impact assessment, cost-benefit analysis, spatial statistics, sentinel sites*

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